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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/907,903	07/19/2001	Kyoko Yamamoto	2185-0554P-SP	9946

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BIRCH STEWART KOLASCH & BIRCH
PO BOX 747
FALLS CHURCH, VA 22040-0747

EXAMINER	
HON, SOW FUN	

ART UNIT	PAPER NUMBER
1772	

DATE MAILED: 10/21/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/907,903	Applicant(s) YAMAMOTO ET AL.	
	Examiner Sow-Fun Hon	Art Unit 1772	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 23 July 2004.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-15 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-15 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 04 has been entered.

Response to Amendment

Withdrawn Rejections

2. The 35 U.S.C. 102(b) and 103(a) rejections have been withdrawn due to Applicant's amendment dated 04.

New Rejections

Claim Objections

3. Claim 2 is objected to because of the following informalities: Claim 2 is dependent on claim 1. Claim 1 already recites a substance filled in the micro-pores of the film, the substance having a refractive index which differs from the refractive index of the micro-porous film. Appropriate correction is required.

Claim Rejections - 35 USC § 103

4. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

5. Claims 1-5, 7-8, 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ouderkirk et al. (US 5,783,120).

Regarding claims 1-2, Ouderkirk has a film which scatters incident light polarized along one axis (column 4, lines 1-10). Hence the film is an anisotropic scattering film, which has a scattering anisotropy when exposed to polarized light.

Ouderkirk teaches that the film comprises a disperse phase within the continuous phase (column 3, lines 60-65). Fig. 3a of Ouderkirk below shows that the disperse phase is in the form of a particle embedded in the continuous phase, which is similar in structure to a pore filled with a solid substance. It can be seen that the particle is substantially in the form of an ellipse when observed on the surface of the film (dotted outline in Fig. 3a).

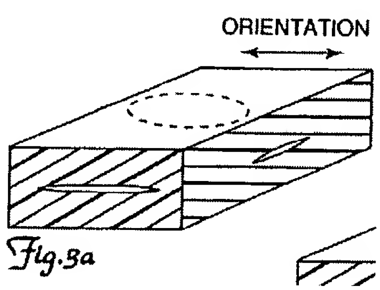


Fig.3a

Fig. 3a of Ouderkirk above shows that the disperse phase of Ouderkirk is similar in structure to a pore when the disperse phase is removed. Ouderkirk teaches that the pore (inclusion) size with respect to wavelength within the film, pore (inclusion) shape and alignment, pore (inclusion) volumetric fill factor and the degree of refractive index mismatch with the

continuous matrix, can be manipulated to provided a range of scattering (reflective) and transmissive properties to the film (column 1, lines 10-20).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have used a micro-porous film with the desired pore characteristics which are subsequently filled by a substance, in lieu of the particle-embedded film of Ouderkirk, in order to obtain an anisotropic scattering film with the desired scattering and transmissive properties, as taught by Ouderkirk.

Ouderkirk specifically teaches that the volume occupied by the particle, is in the form of an ellipse, wherein the major axis is in the same direction as the direction of orientation (disperse phase is elliptical in a cross-section taken along a plane perpendicular to the axis of orientation (column 10, lines 10-20). Figure 3a shows only one axis of orientation. For an ellipse, the ratio of the major axis to the minor axis of the ellipse is over 1.

Ouderkirk teaches that the major axis size (length) of the volume occupied by the particle, is preferably over 4 times the wavelength, while the minor axis size (diameter) is less than 0.5 the desired wavelength (column 55-65), and that the wavelength of light of interest is in the visible spectrum (column 15, lines 1-5). Hence the minor axis size of the volume occupied by the particle, of Ouderkirk is smaller than a wavelength of light in the visible light region. Thus the volume occupied by the particle of Ouderkirk is similar in structure to a micro-pore as defined by Applicant (Original claim 1 and Specification, page 6, 5th paragraph). Therefore a film with embedded particles of the size described above is similar in structure to a micro-porous film with a solid substance filled in the micro-pores, as defined by Applicant.

Ouderkirk teaches that the indices of the film matrix (continuous phase) and the disperse phase are mismatched (column 3, lines 60-70). Hence the refractive index of the solid substance filled in the micro-pores of the micro-porous film differs from the refractive index of the micro-porous film.

Ouderkirk gives Examples 34-35, of the volume fraction of the disperse (minor) phase, and hence the micro-pores, as being 50 (%) (column 25, lines 35-40) which is within the claimed range of 30 to 75, and teaches that it is dependent on the specific choice of materials for the continuous and disperse phases (column 12, lines 20-30).

Regarding claim 3, Ouderkirk teaches that the micro-porous film (continuous phase) is composed of a polymer (column 4, lines 20-30).

Regarding claim 4, Ouderkirk teaches that the volume fraction of the disperse (minor) phase, and hence the micro-pores, is 50 (%) (column 25, lines 35-40) which is within the claimed range of 30 to 75. Hence the micro-porous film (minus the solid substance in the micro-pores) inherently has a gas permeability which overlaps the claimed range of from 5 to 5,000 sec/100 cc.cm^2.

Regarding claim 5, Ouderkirk teaches that the disperse phase, and hence the micro-pore, has an aspect ratio (of the major axis to the minor axis) of at least 5 (column 11, lines 60-70), which is within the claimed range of 3 to 30.

Regarding claim 7, Ouderkirk teaches that the solid substance-filled micro-pores (disperse phase) exhibit a birefringence (column 9, lines 10-15) which is a result of the optical anisotropy of the solid substance in the micro-pores.

Regarding claim 8, Ouderkirk teaches that the solid substance in the micro-pores (disperse phase) is oriented in one direction (column 9, lines 5-20).

Regarding claim 10, Ouderkirk teaches that the disperse phase can include liquid crystal (column 12, line 55), which is inherently anisotropic, as defined by Applicant (Specification filed 07/19/01, page 13, last paragraph).

6. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ouderkirk as applied to claims 1-5, 7-8, 10 above, and further in view of Hirai et al. (US 5,103,327).

Ouderkirk has been discussed above, and teaches a liquid crystal display (LCD) panel with the anisotropic scattering film (column 30, lines 55-60), but fails to teach that the refractive index of the polymer, n, and the extraordinary refractive index n_e and ordinary index n_o of the liquid crystal should be such that $0.01 < |n - n_e| > 0.6$ and $0 \leq |n - n_o| < 0.05$.

Hirai teaches a liquid crystal panel (display element) comprising an anisotropic scattering sheet (liquid crystal polymer composite material) (column 4, lines 40-50). Hirai teaches that the value of the refractive index anisotropy liquid crystal should be large, $|n_e - n_o| > 0.22$ (Δn), in order to obtain high scattering property values (column 8, lines 25-35). The ordinary refractive index n_o of the liquid crystal should agree with the refractive index of the polymer matrix n (n_p) in order to obtain high transmittance when an electric field is applied, that is, $|n_o - n| = |n - n_o| < 0.03$ when $n_o - 0.03 < n$ is rearranged (column 8, lines 25-40). When $n = n_o$, then $|n_e - n_o| = |n_e - n| = |n - n_e| > 0.22$.

As shown above, Hirai et al. teaches that $|n - n_o| < 0.03$ for high scattering in the absence of an electric field and $|n - n_e| > 0.22$ for high transmittance upon application of an electric field (column 8, lines 25-35). Therefore it would have been obvious to one of ordinary skill in the art

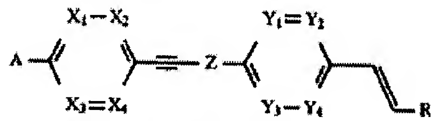
at the time the invention was made, to have used the criteria of Hirai to govern the refractive indices, n, n_e and n_o, of the anisotropic scattering film of Ouderkirk, in order to obtain the desired high scattering in the absence of an electric field, and high transmittance in the presence of an electric field, as taught by Hirai.

7. Claims 6, 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ouderkirk as applied to claims 1-5, 7-8, 10 above, and further in view of Tsubata et al. (US 5,762,825).

Ouderkirk has been discussed above, and teaches a liquid crystal display (LCD) panel with the anisotropic scattering film (column 30, lines 55-60), but fails to teach that the liquid crystal is polymerizable, or that it includes the claimed acetylene connected 1,4-phenylene unit formulae.

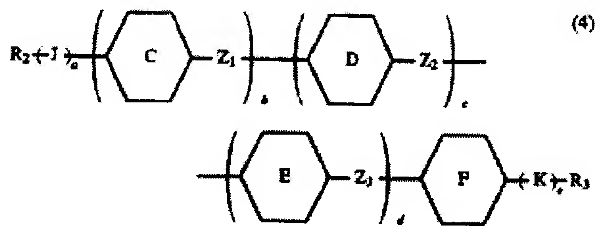
Tsubata teaches a liquid crystal mixture having a large anisotropy of refractive index and a polymer dispersed liquid crystal device comprising the same (column 1, lines 5-15).

A liquid crystal mixture containing (a) at least one compound of a compound of the formula (1):



(1)

in which R is a C_1–C_{12} alkyl group, etc.; X_1, X_2, X_3, X_4, Y_1, Y_2, Y_3 and Y_4 represent, independently each other, CH, CF or N; A is a hydrogen atom, a 4-R_1-(cycloalkyl) group, etc. in which R is a C_1–C_{12} alkyl group, etc. and p is 0 or 1; and Z is —C≡C— or a single bond, and (b) at least one compound of the formula (4):



(4)

wherein rings C, D, E and F represent, independently each other, 1,4-phenylene, etc. which may be substituted by 1, 2 or 3 fluorine atoms; R_2 is a hydrogen atom, a C_1–C_{12} alkyl group, etc.; R_3 is a hydrogen atom, a fluorine atom, a fluoromethyl group, etc.; Z_1, Z_2 and Z_3 represent, independently each other, —COO—, —OCO—, —OCH_2—, —CH_2O—, a C_1–C_5 alkylene group, a C_2–C_5 alkenylene group, etc.; J and K represent, independently each other, a methylene group or —O—; a, b, c, d and e represent, independently each other, 0 or 1.

As seen above, Tsubata teaches that the liquid crystal in the polymer dispersed liquid crystal has formulae overlapping the range of formulae claimed by Applicant, comprising the 1,4-phenylene units connected by the acetylene connector ≡, also known as the C_2 alkenylene group. The double bond in the terminal group R is polymerizable.

Tsubata shows that the anisotropy of the refractive index of the liquid crystalline compounds is large compared to liquid crystalline compounds with non-acetylene connected 1,4

biphenylene units (column 2, lines 25-35 and column 37, lines 6-11). Tsubata teaches that the liquid crystal compounds provide a very sharp threshold property, which improves the picture quality of the liquid crystal device (column 46, lines 55-65).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have used the liquid crystals with the acetylene connected 1,4 biphenylene units and polymerizable end group of Tsubata, as the liquid crystal compound in the anisotropic scattering film of Ouderkirk, in order to obtain the desired picture quality.

8. Claims 12-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ouderkirk as applied to claims 1-5, 7-8, 10 above, and further in view of Larson (US 5,751,388).

Ouderkirk has been discussed above, and teaches a liquid crystal display (LCD) panel with the anisotropic scattering film (column 30, lines 55-60), but fails to teach the specific configuration of the anisotropic scattering sheet with respect to the other components of the liquid crystal display.

Regarding claims 12-13, Larson has a liquid crystal display which comprises a liquid crystal display panel having a polarizing plate on the front surface side and the back surface side (front 15 and rear 16 polarizers), the anisotropic scattering film (PSSE 17), a light guide (light source 13 and light guide 102 or 112) and a diffuse reflection plate (diffusely reflecting cavity 11) in that order (column 4, lines 25-35 and column 9, lines 60-70).

Regarding claim 15, Larson teaches that a retardation plate (retarder108) is located between the anisotropic scattering film (PSSE 109) and the reflection plate (reflector mirror 105) (column 10, lines 5-15).

Regarding claim 14, Larson teaches that the transmission axis of the anisotropic scattering film and the transmission axis of a polarizing plate on the back surface side of the liquid crystal panel are approximately equal (PSSE transmits the majority of the light polarized along one optical axis (column 4, lines 45-55) so that since it has comparable axis of symmetry with a parallel-aligned absorbing polarizer (column 5, lines 40-50), the transmission axes are comparably parallel).

Larson teaches that the anisotropic scattering sheet (PSSE) is a uniaxially-aligned polymer-dispersed liquid-crystal (PDLC) where the liquid crystal droplets are elongated (into ellipses), oriented along one direction (stretched along axis 23) and the refractive indices of the liquid crystal are selected such that the extraordinary refractive indices are highly mismatched (column 6, lines 30-40). The liquid crystal substance is polymerized (UV curable LC, polymeric LC) (column 8, lines 1-5).

When the liquid crystal droplets are stretched (column 6, lines 25-35) they form ellipses which have a major and a minor axis whereby the ratio of the major axis to the minor axis is over 1. See Fig. 3a below wherein the major axis of the ellipse 22 is parallel to the stretch direction of polymer matrix 21.

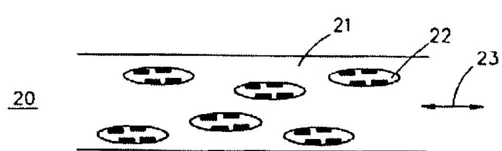


Fig. 3a

Hence the uniaxially-aligned polymer-dispersed liquid-crystal light-scattering film is similar in structure to a liquid-crystal filled micro-porous film.

Larson teaches that the light-scattering film (PSSE) provides a means for recapturing light energy which would otherwise be lost in the display, while reducing degradation and heat-build-up due to light absorption (abstract), resulting in higher optical efficiency of the liquid crystal display (column 2, lines 60-70).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have used the specific configurations of the light-scattering film with respect to the other components of the liquid crystal display, as taught by Larson, for the light-scattering film in the liquid crystal display of Ouderkirk, in order to obtain a liquid crystal display with the desired optical efficiency, as taught by Larson.

Response to Arguments

9. Applicant's arguments with respect to claims 1-15 have been considered but are moot in view of the new ground(s) of rejection.

Any inquiry concerning this communication should be directed to Sow-Fun Hon whose telephone number (571)272-1492. The examiner can normally be reached Monday to Friday from 10:00 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Harold Pyon, can be reached on (571)272-1498. The fax phone number for the organization where this application or proceeding is assigned is (703)872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

S. Hon.

Sow-Fun Hon

10/15/04